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OCS STUDY

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MMS 87-0064

② IMPACTS OF OUTER CONTINENTAL SHELF (OCS) DEVELOPMENT ON RECREATION AND TOURISM

④ VOLUME 1:

EXECUTIVE SUMMARY

⑤ U.S. Dept. of The Interior

COMPLETED

I

"This report has been reviewed by the Pacific Outer Continental Shelf Region, Minerals Management Service, U.S. Department of the Interior and approved for publication. The opinions, findings, conclusions or recommendations expressed in the report are those of the authors, and do not necessarily reflect the views of the Minerals Management Service. Mention of trade names or commercial products does not constitute endorsement or recommendations for use. This report has not been edited for conformity with Minerals Management Service editorial standards."

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GLOSSARY OF TERMS

Boating includes power boating, sailing, and other boating.

Ocean fishing is strictly saltwater fishing.

Water-dependent recreation includes ocean swimming, scuba and snorkeling, body surfing, and board surfing.

Water-enhanced beach recreation includes picnicking, hiking/backpacking, nature appreciation, visiting scenic areas, sunning, beachcombing, beach games, and camping.

Geopieces are subcounty geographic areas used by the California Department of Parks and Recreation in their planning studies. There are approximately 450 geopieces statewide, but this study only uses 49 along the coast.

Tourism refers to the economic activity resulting from engaging in recreation.

I. INTRODUCTION AND STUDY OBJECTIVES

This volume is part of the final report of a project to investigate the impacts of Outer Continental Shelf (OCS) oil and gas development on coastal recreation in California. The project was intended to provide the Minerals Management Service with an analytical tool to evaluate possible economic impacts from OCS development. In particular, the study was designed to provide MMS staff who work on the lease sale EIS's with an objective technique for estimating the impacts to coastal communities from events that might occur as a result of lease sales: oil spills, onshore construction, and construction of platforms offshore. The study is not a prediction of these events. To achieve the overall goal, the project had several specific objectives:

- Provide "profiles" of 1982 socioeconomic conditions in coastal communities, including an analysis of the relative importance of the tourist industry in each coastal county;
- Develop a methodology for determining the effects of OCS development on coastal recreation
    - The methodology should enable estimation of not only the construction and operation impacts from normal OCS development, but also the potential impacts from an oil spill.
    - The methodology should enable assessment of impacts on beach activities, boating and recreational fishing.
    - The methodology should enable estimation of changes in recreation trips, changes in recreational spending and changes in economic value to recreationists;
- Recommend mitigation measures that may reduce the negative effect of OCS development on coastal recreation.

The final report for this project is comprised of five volumes:

Volume 1: Executive Summary
Volume 2: Final Report and Case Studies
Volume 3: Detailed Methodology Review
Volume 4: User's Guide
Volume 5: Programmer's Manual

This volume presents the study conclusions, summarizes the methodology and describes the impacts estimated by the model for four case studies.

II. STUDY ASSUMPTIONS AND LIMITATIONS

A. Assumptions and Limitations

The following describes the assumptions used in the analyses and limitations of the methods and data.

1. An inherent assumption of the model used in this study is that the total number of recreation trips in California is fixed, and therefore that oil spills or aesthetic impacts can affect the distribution of trips, but not the total number.

This model feature has no practical effect on the results for negatively affected areas, but it means that other areas will necessarily gain recreation trips and income at the expense of the negatively impacted areas. Therefore, to the extent that our study area is broadly defined, the negative impacts will be offset somewhat by positive impacts. For the state as a whole, for example, there would be no effect on total attendance, and probably only small effects on total spending, resulting from our assessment of changes in length of stay. When reviewing the impacts, the reader should keep in mind that progressing from the geopiece, to the county level, to the planning area level (the largest area for which we determine impacts), the negative impacts will be progressively more offset by gains to other sites.

2. Only economic values to people who actually participate in coastal recreation were considered, and only to the extent that these people participate. Other economic values are excluded from the study. Non-recreational values, for example, are not part of this study. Such values not considered include commercial fishing and non-recreational values placed on the environment, such as wildlife losses from an oil spill.

A special category of recreation values not covered in this study is known as "bequest, option and existence" values. These are the values placed on a resource by people who do not visit that resource. By definition, then, these values will be excluded by a travel cost approach to determining economic values. Bequest values refer to the benefits to individuals from knowing that a resource can be enjoyed by their heirs, even though they may never visit the site themselves. Option values refer to benefits from maintaining for people the "option" of visiting a resource, even though they never actually make any visits. Existence values accrue to people who derive satisfaction from simply knowing that a resource is intact, even though they have no plans ever to go. These values elude measurement using the observed travel behavior of active recreationists, and are generally only able to be estimated using a contingent value survey, in which people are asked hypothetical questions about a resource.

3. Evaluation of impacts on some recreation areas have not been included in this study. We attempted to include all of the federal, state, county and city recreation areas along the California coast, and this study does cover over 200 sites. Some "pocket" beaches, however, are either excluded or lumped together with larger nearby beaches. A few beaches with special attributes were purposely excluded: the UC Santa Barbara beach, with its local, "captive" population and its policy of excluding off-campus visitors, was omitted because neither the gravity model nor the travel cost method is appropriate under these circumstances. Pismo Dunes Vehicular Recreation Area was omitted because the primary activity there does not fall into any of the categories for which impact is expected.

A more general omission is that of non-designated recreation areas. We could only include those areas that were identified as recreation sites and for which key parameters could be defined, such as length of beach frontage. Not all recreation, however, takes place at such sites. Some people obviously will choose to recreate in out-of-the-way non-designated areas. However, because of the large number of public recreation areas available in California and because these areas generally have much better access and facilities than non-designated areas, we believe that the bulk of coastal recreation occurring in the state probably occurs within the areas included in our model.

4. The tentative link between OCS development and beach attractiveness is onthe frontier of recreation analysis. To our knowledge no previous research has produced other, similar results to use as a benchmark. Moreover, the concept of beach "attractiveness" is quite subjective. Each individual has his or her own perception of what makes a beach appealing and of how OCS development will affect its appeal. We designed an index of OCS development that follows two principles we felt most people would probably accept: (1) that the impact is greater when the platforms are closer to the shore, and (2) that the impact is greater when more platforms are visible. Our index is not the only way to combine those principles, however, and others may prefer to try other methods. Especially given the uncertainties in the regression results (reported in Volume 3) we believe that it is appropriate to review the relationship between OCS development and recreation using a different approach. Results from such a study would constitute an invaluable "second opinion" on this complex issue.

5. Whereas data on beach attendance is sometimes of questionable accuracy, extensive data at least does exist. In contrast, data on boating and fishing activities is much less complete. This affected the model in two ways. First, in the absence of data to analyze boating and fishing, we assumed that OCS construction and operations did not affect them, and focused instead on an oil spill's effects on these activities. We believe this conclusion is not unreasonable, but it should be re-examined when additional data is available. Second, we could not differentiate the relative "attractiveness" of coastal geopieces for fishing, as we did for boating and beach use. When evaluating the effects of an oil spill, therefore, the model "sends" fishing trips to geopieces according to their proximity to population centers. This assumption also should be reviewed when additional data makes it possible.

III. METHODOLOGY

A. Introduction and Approach

The particular components of OCS development whose effects were studied include construction activities, long-term operation and potential oil spills. Coastal recreation is defined in this study to include boating, fishing, water-dependent activities and water-enhanced activities. Water-dependent recreation includes ocean swimming, scuba and snorkeling, body surfing, and board surfing. Water-enhanced beach recreation includes picnicking, hiking/backpacking, nature appreciation, visiting scenic areas, sunning, beachcombing, beach games, and camping. The methodology estimates not only the change in number of participation-days, but also changes in the economic value of recreating to participants and in the value of recreation spending to local recreation economies.

The multiple objectives require a methodology that is detailed and flexible, and the methodology developed combines a series of models that together meet the needs of this study. First, a **gravity model** estimates the number of recreation trips to different coastal segments. The gravity model has two features central to this study: it determines where people come from to recreate at particular coastal segments, and it determines people's choices of coastal segments according to the relative "attractiveness" of those segments. A key strength of this method is that the "attractiveness" measure can be altered according to the level of OCS development for which impact is being estimated. The gravity model used in this study is an adaptation of one developed by the California Department of Parks and Recreation. (See Arnold, Vol. I and II, for a description of the survey data used in the CDPR model.) The model uses California counties as origin zones (see Figure 1-1) and CDPR recreation areas as destinations.

The second model component is the **economic effects model.** Its purpose is to determine the effect that different levels of recreation activity (as predicted by the gravity model) will have on the local economy of coastal communities. The economic effects model first converts the change in recreation to a change in tourist spending using the daily spending figures shown in Table 1-1. Then the model determines the impact that the spending change has on the total economy, accounting for the "ripple" effect or secondary spending changes.

Table 1-1
Average Daily Spending By Tourists
Engaging In Coastal Recreation

Activity	Day Trip	Overnight Trip
Marine fishing	$47.66	$67.79
Marine boating	35.09	53.87
Water-related	13.14	27.67
Water-enhanced	13.14	27.67

The third model component is the **consumer surplus model.** Consumer surplus is a measure of the amount that people would be willing to pay over and above the amount that they actually have to pay. Consumer surplus is used as a measure of the economic value of recreation sites. Changes in that value resulting from OCS activities are reflected in changes in consumer surplus. The consumer surplus model estimates this consumer surplus by inferring willingness to pay from the travel patterns observed among recreationists. The technique is based on the principle that the farther people travel to recreate, the more money they are presumably willing to pay for that recreation. The consumer surplus model uses the distribution of travel patterns to develop demand curves that are then used to determine consumer surplus.

Figure 1-2 shows how the model components are related to each other.

IV. CASE STUDIES

A. Objectives

This chapter summarizes the results of four case studies, in which the model was applied to evaluate the impacts of two actual OCS development scenarios and to two hypothetical oil spill scenarios. By applying the model to examples of its intended use, the case studies help refine the model. It also improves the ease of using the model and tests the reasonableness of the model's estimates.

A weakness of the four case studies discussed in this chapter, however, is that only one (Eastern Santa Barbara Channel) concerns an actual, past occurrence. Moreover, too little is known of the actual effects in the coastal areas to enable a formal test of the model's predictions. Nevertheless, the model's output can still be examined for reasonableness.

Figure 1-1

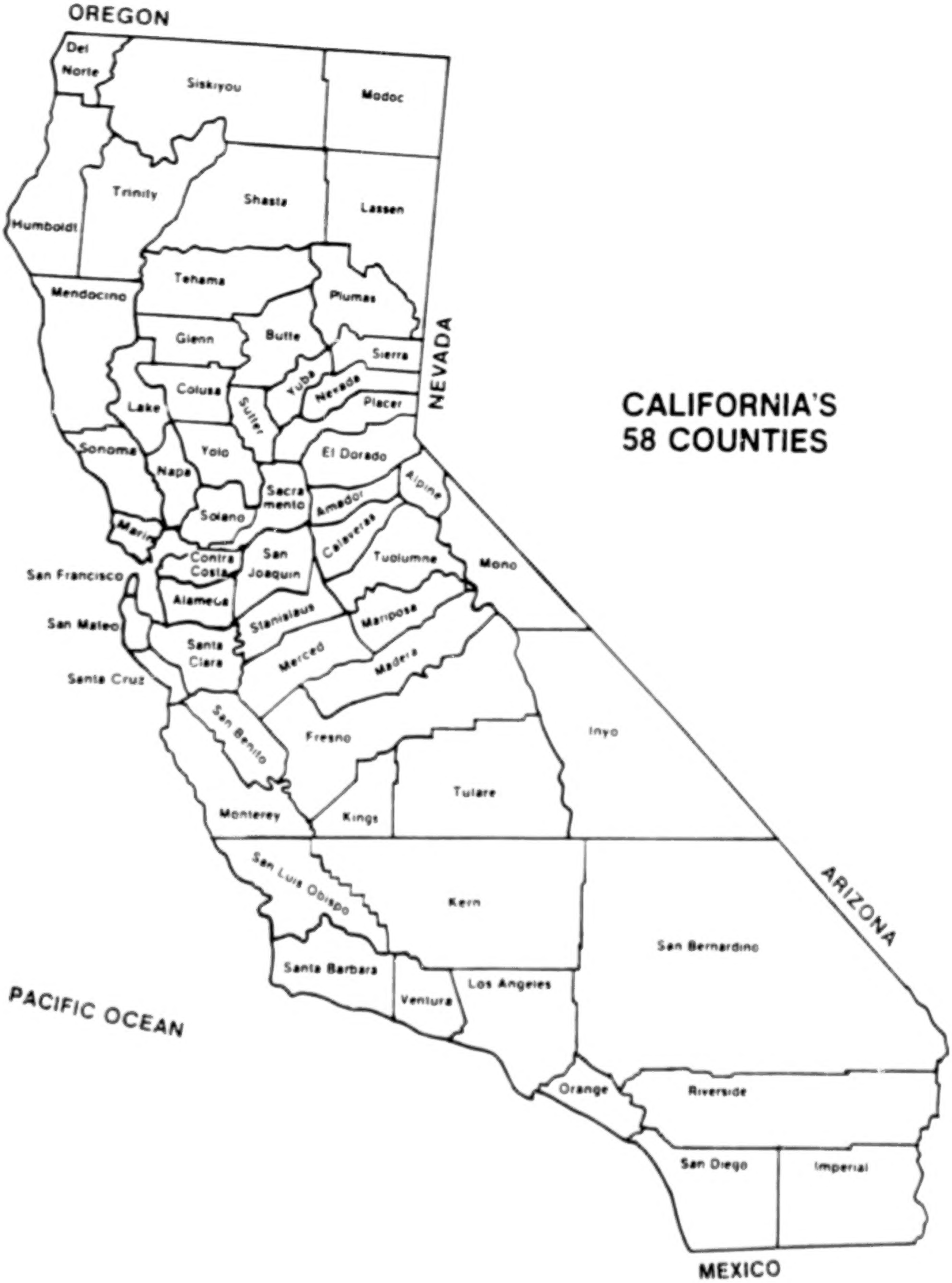
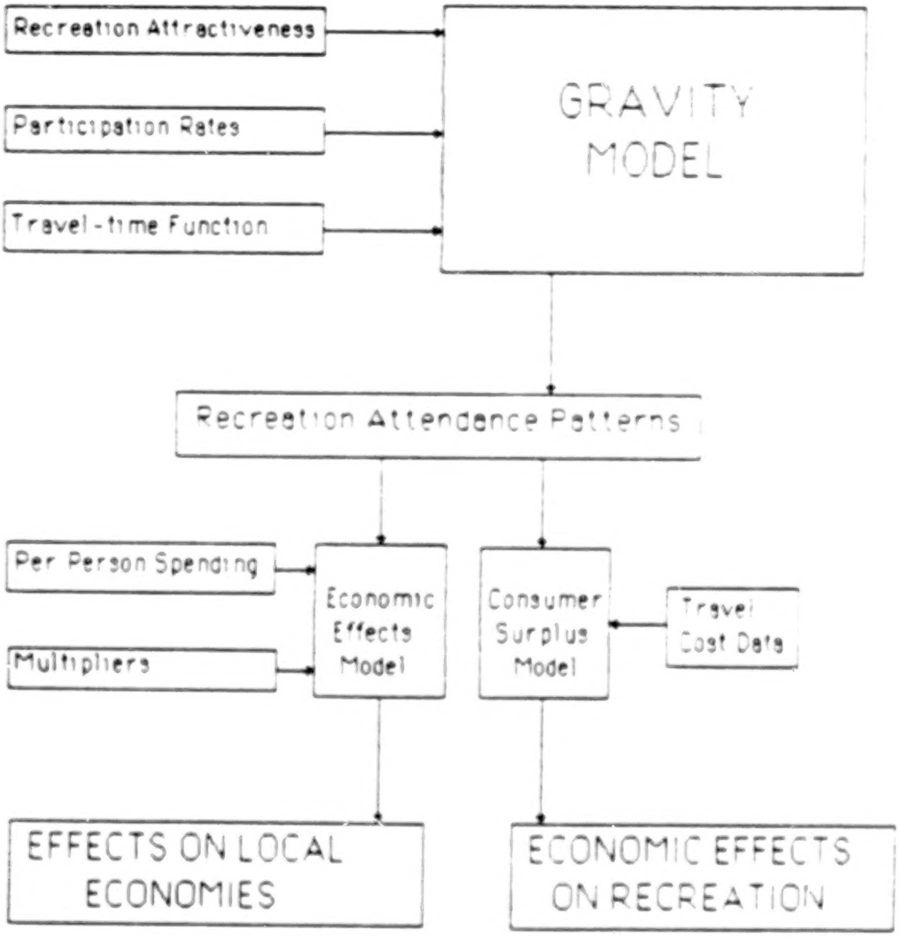

CALIFORNIA'S
58 COUNTIES
OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
Del Norte
Siskiyou
Modoc
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Mendocino
Glenn
Butte
Sierra
Colusa
Yuba
Nevada
Lake
Sutter
Placer
Sonoma
Yolo
El Dorado
Napa
Sacramento
Alpine
Solano
Amador
Marin
Calaveras
Contra Costa
San Joaquin
Tuolumne
Mono
San Francisco
Alameda
San Mateo
Stanislaus
Mariposa
Santa Clara
Merced
Madera
Santa Cruz
San Benito
Fresno
Inyo
Tulare
Monterey
Kings
San Luis Obispo
Kern
San Bernardino
Santa Barbara
Ventura
Los Angeles
Orange
Riverside
San Diego
Imperial

Figure 1-2
Impact of OCS Development on Coastal Recreation Model Components



B. Construction and Development Case Studies

1. Eastern Santa Barbara Channel Scenario

The Eastern Santa Barbara Channel scenario includes the construction and operation of three platforms known as Grace, Gina and Gilda, as well as the associated pipelines and onshore processing facility. Figure 1-3 shows the location of the various facilities evaluated in this case study, as well as the location of nearby coastal recreation areas.

The three platforms are approximately 6.5, 14.8 and 17.6 kilometers (3.5, 8 and 9.5 nautical miles) offshore, respectively. The pipeline from one, Grace, ties into an existing subsea pipeline network that connects platform Hope to onshore facilities, so no beach disruption results from its construction. The pipelines from the other two platforms join near the shore and thus share a common landfall. These pipelines (one for oil, one for gas and one for water return) come ashore at Mandalay Beach in Ventura County and proceed to a processing facility built adjacent to the beach at the Southern California Edison electric power plant. Figure 1-3 shows the location of these facilities.

Construction

The primary construction impacts on recreation that can be addressed by this model are **displacement** of activities from a beach and **construction noises** that are incompatible with beach enjoyment. In this scenario, Mandalay Beach is the landfall for pipelines from Gina and Gilda, and is the location for assembly of pipelines pulled offshore as well as the site of a new processing facility.

The width of the actual pipeline corridor crossing the beach is approximately 12 meters (40 feet). However, the noise generated during pipeline fabrication and burial exceeds the California Office of Noise Control standard for beach use at a distance of up to 488 meters (1,600) feet from the construction site. In the case study we define a buffer zone around the construction site that excludes beach use activities within 488 meters during the construction period.

In conducting a similar analysis for the less noisy construction of the processing facility, we used a 30 meter (100 foot) buffer zone. Because the processing facility is 140 meters (460 feet) from the shore its construction has no significant impact on beach use.

Construction began in June, 1981, and lasted about 4 months. The four month period coincided with the heaviest beach use during the year, affecting nearly 60 percent of annual attendance. According to the California Department of Parks and Recreation, about 60 percent of beach use occurs between June and September.

Construction impacts associated with this development scenario affected only Mandalay Beach and result in small overall impacts on Ventura County's economy.

Despite the fact that construction raises noise levels beyond the California standard for 4 summer months, the model estimates the overall decrease in attendance in the coastal segment to be probably only about 0.4 percent that year (see Table 1-2). The beach attendance decline of 9,000 people represents those who diverted their trips away from this coastal segment. Other beach goers made trips to this coastal segment but may have diverted to one of the six other beaches instead of Mandalay. Neither boating nor fishing attendance likely decrease, and no other geopiece is negatively impacted by the construction.

Figure 1-3
Eastern Santa Barbara Channel Case Study

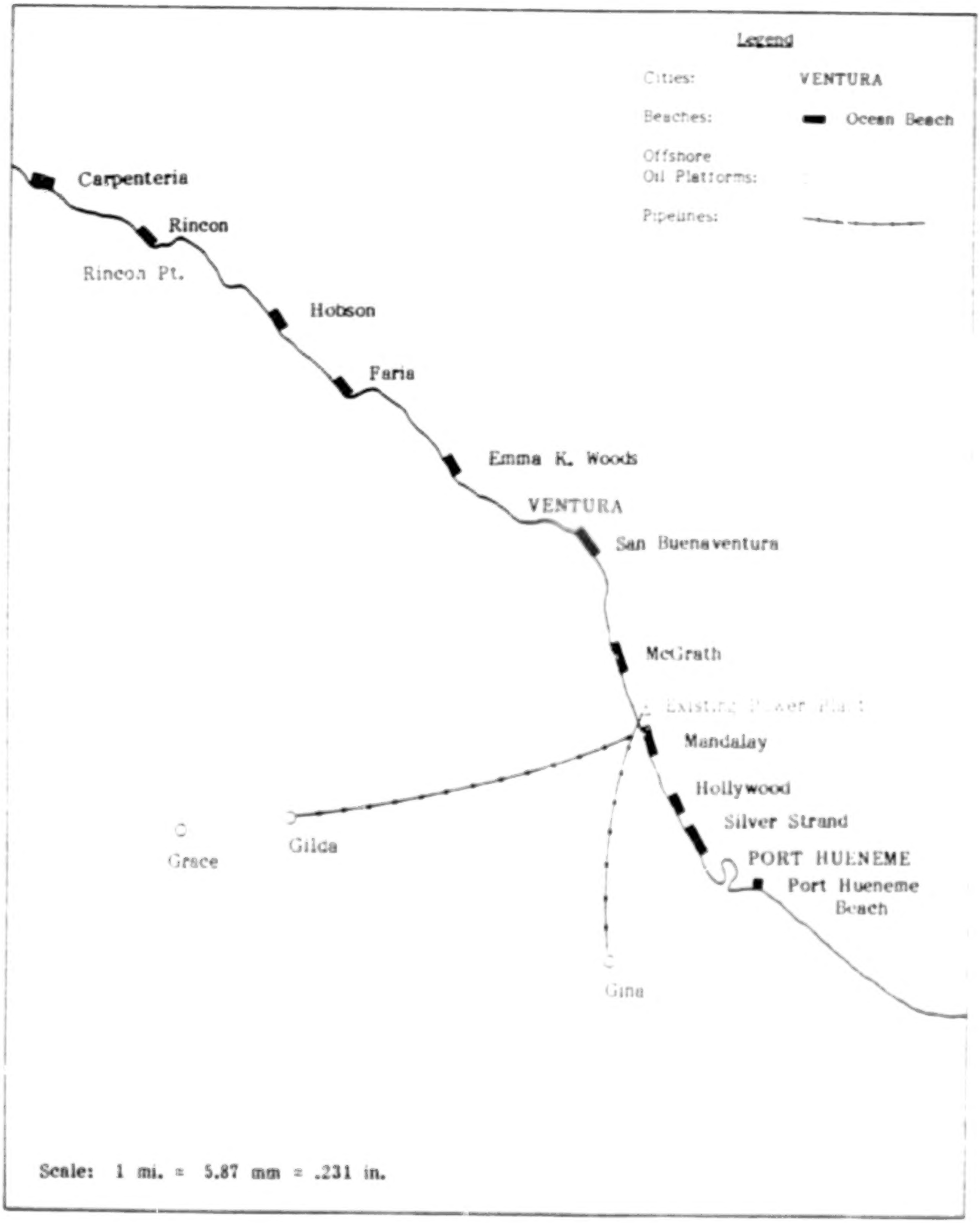


TABLE 1-2
EFFECTS FROM EASTERN SANTA BARBARA CHANNEL SCENARIO
CONSTRUCTION IMPACTS

EFFECT	BASELINE	CHANGE	PERCENT CHANGE
Recreation Attendance in Geopiece 437	2,029,000	(9,000)	-0.4%
Visitor Spending in Geopiece 437	$89,040,000	($187,000)	-0.2%
Visitor Spending in Ventura County	$156,320,000	($186,000)	-0.1%
Consumer Surplus in Geopiece 437	$16,190,000	($69,000)	-0.4%

TABLE 1-3
EFFECTS FROM EASTERN SANTA BARBARA CHANNEL SCENARIO
OPERATION IMPACTS

EFFECT	BASELINE	CHANGE	PERCENT CHANGE
Recreation Attendance in Geopiece 437	2,029,000	(58,000)	-2.9%
Recreation Attendance in Geopiece 438	664,000	(7,700)	-1.2%
Visitor Spending in Geopiece 437	$89,040,000	($1,250,000)	-1.4%
Visitor Spending in Geopiece 438	$44,980,000	($180,000)	-0.4%
Visitor Spending in Ventura County	$156,320,000	($1,430,000)	-0.9%
Consumer Surplus in Geopiece 437	$16,190,000	($460,000)	-2.8%
Consumer Surplus in Geopiece 438	$4,990,000	($57,000)	-1.1%

Spending changes due to construction are less than 0.2 percent in Mandalay's coastal segment and less than 0.1 percent overall in Ventura County, compared to baseline spending by participants in coastal recreation.

Operation

The Grace, Gina & Gilda scenario includes two types of impacts associated with their continuing operation (apart from the possibility of oil spills). First is the visual impact of the offshore platforms themselves. Second is the aesthetic impact of the onshore processing plant. The pipelines are buried and should have no continuing impact on recreation.

The visual impact of offshore oil rigs is addressed in the model by changing attendance at nearby beaches. The user may specify a reduction in attendance (as a percent reduction) at specific beaches within 15 miles of new platforms. In this scenario, attendance is assumed to decline from 1 to 10 percent at eleven nearby beaches, the percent reduction varying according to the distance between the platforms and specific beaches. The aesthetic impact of the processing plant is considered insignificant because of a barrier wall, landscaping, and the backdrop of an existing power plant.

Thus defined, operations impacts would result in a 1.2 to 2.9 percent decline in beach attendance for the two entire coastal segments containing the affected beaches (see Table 1-3, p. 1-9). Neither boating nor fishing attendance are impacted.

Overall, in our case study, spending impacts in Ventura County amount to nearly 1 percent of "without project" conditions. In total, this impact translates to 55 fewer jobs and over $1 million less income per year. Consumer surplus losses for beach activities in the two affected geopieces totals $517,000, compared with a base of $21 million.

2. Northern Santa Barbara County Scenario

This scenario represents the planned development off Point Perdenales in Northern Santa Barbara County. Union Oil Company and Exxon plan to install two oil rigs in the waters about 9 miles from the coast, naming them Irene and Independence, respectively. Subsea pipelines are planned to run from Independence to Irene, and from Irene to a landfall north of the Santa Ynez River. From the landfall, the pipelines are planned to proceed inland to a dehydration facility in Lompoc. An electric substation is planned to be built near Ocean Beach, south of the Santa Ynez River, and electric cables will be buried through the shore zone and laid on the ocean floor out to the platforms. Figure 1-4 shows the location of these facilities.

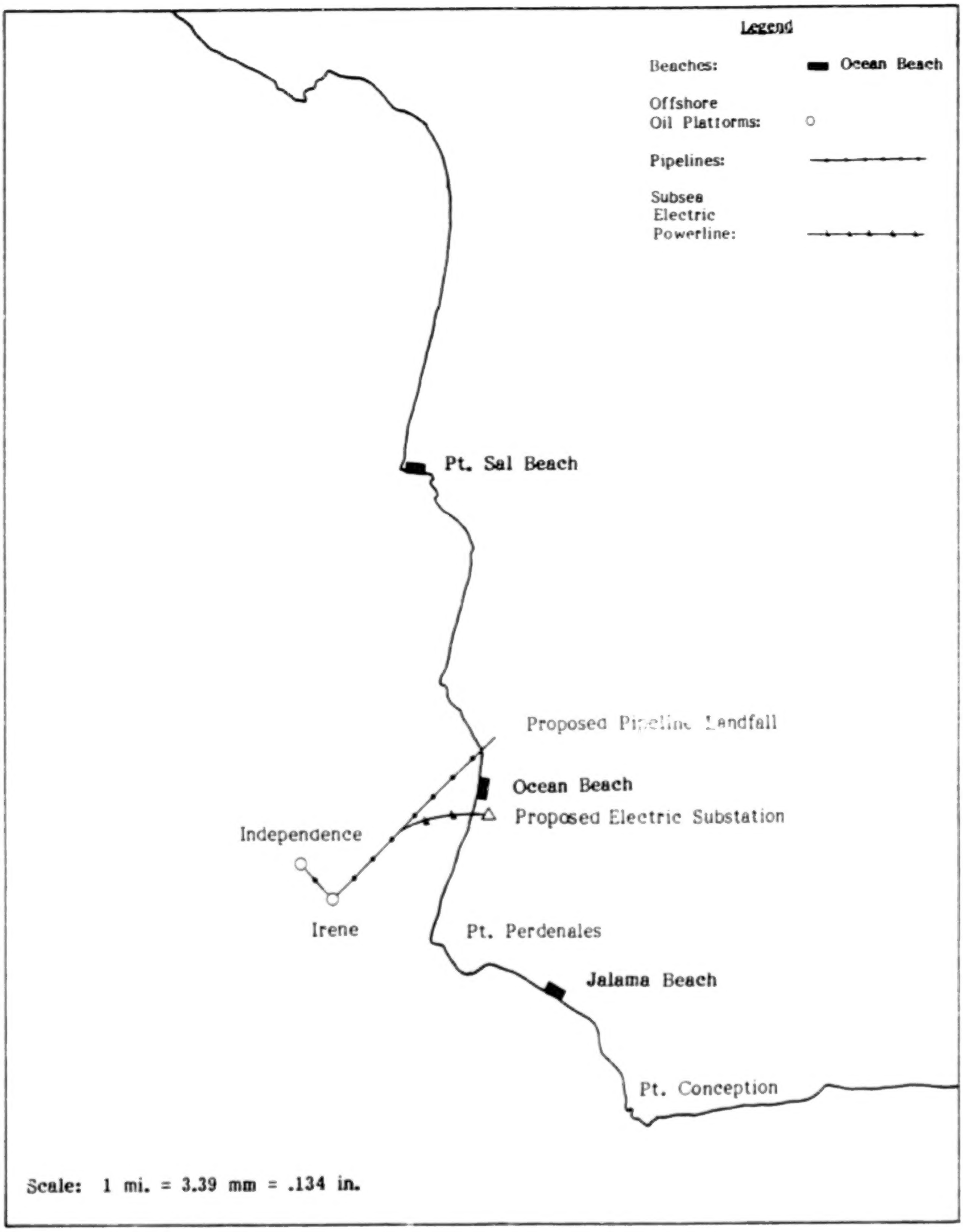
Construction

The pipeline landfall is located 4,000 feet north of the Ocean Beach County Park, the area's main coastal recreation site. Construction noise levels would attenuate rapidly enough to be negligible at the Ocean Beach. We therefore conclude that the construction impacts on coastal recreation will be insignificant.

Operation

The electric substation is considered not to be close enough or obtrusive enough to adversely affect Ocean Beach. The substation will be located east of the

Figure 1-4
Northern Santa Barbara County
OCS Construction and Development Case Study


Legend
Beaches:
▬ Ocean Beach
Offshore Oil Platforms: ○
Pipelines:
Subsea Electric Powerline:
Pt. Sal Beach
Proposed Pipeline Landfall
Ocean Beach
Proposed Electric Substation
Independence
Irene
Pt. Perdenales
Jalama Beach
Pt. Conception
Scale: 1 mi. = 3.39 mm = .134 in.

railroad tracks, approximately 2,000 feet southwest of the Ocean Beach County Park parking lot. The substation facilities will generally be 7 to 8 feet tall, with a breaker and transformer reaching 28 and 10 feet, respectively. The substation will be surrounded by a chain link fence and landscaping is planned to screen the view from the beach and park.

One or both platforms should be visible from one beach, Ocean Beach, which currently has no views of any existing platforms. In this scenario, Ocean Beach is assumed to lose 10 percent of its attendance. Overall, Geopiece 241 would lose about 1,800, or 2.4 percent of its baseline attendance of 76,000. There should be no decrease in attendance for either boating or fishing under this scenario.

Based on our assumptions, the model predicts that the demand for goods and services by coastal recreationists is likely to decrease by about 0.7 percent in Geopiece 241, or $65,000 from a base of $9,090,000. The greatest impacts would be in the hotel sector and the transportation services sector, with decreases in expenditures over 1 percent in each sector. Counting the multiplier effect, about $115,000 less might be spent in Santa Barbara County. This amount represents, however, just 0.03 percent of baseline spending by coastal recreationists in the County.

Baseline consumer surplus will decrease by 3.6 percent for water-dependent beach activities and 2.4 percent for water-enhanced activities in Geopiece 241. Total consumer surplus loss amounts to approximately $12,000 annually, or 3 percent of the baseline consumer surplus of $400,000.

3. Evaluation of Model Performance

In the case of the OCS development and operations scenarios, the model exhibits several favorable attributes. The input variables are sufficiently flexible to characterize most of the development and operation features that may affect recreation. Specifically, construction impacts can be reasonably well represented by determining how much beach frontage is foreclosed by construction activities, either directly through preemption of the beach or indirectly because of the construction noise. All construction impacts can be apportioned over a part of a year with a duration factor.

Operation impacts are represented by an aesthetic variable and by changing beach attendance. This variable is a subjective aesthetic rating of the beach that can be altered if onshore facilities are visually disturbing. Beach attendance can be changed by the user to a percent of normal beach attendance based on the user's estimate of the effect on such attendance produced by offshore platforms. Changes in both the aesthetic variable and the percent of beach attendance will alter the attractiveness index for a coastal segment and thereby adjust the pattern of recreation trips.

Because of the lack of appropriate data, a quantitative determination of the accuracy of several elements of the model is not possible at this time, thus the crucial evaluation question is the reasonableness of the results. The construction impacts are based upon an analysis of how construction activities affect several model variables. These impacts can therefore properly be evaluated for reasonableness. The operations impacts, in contrast, rely on the user's input of beach attendance changes. As such, the model results can be no more reasonable than are the original attendance estimates. In the absence of comparable studies made from a different approach, however, any assessment of reasonableness, even of construction impacts, must be somewhat subjective. Given that caveat, the remainder of this section comments on the apparent reasonableness of several model aspects.

First, the distribution of recreation trips to different coastal destinations coincides with reported attendance data reasonably well. It is inappropriate to compare too closely the absolute numbers of people assigned by the model to each beach with the reported attendance figures. In the first place, "beach" trips include those for "water enhanced" activities, which by their nature may not always occur at a beach. Picnicking, for example, may occur frequently at scenic areas along the highway and would not be included in the attendance figures for any beach. Second, the attendance figures at beaches are estimated from traffic counts or by lifeguards, and should not be thought of as extremely reliable.

A key model result is attendance response levels to the OCS development and operation scenarios. For example, the model predicts a 0.4 percent decline in annual attendance during the year of construction for the geopiece in which construction of the Grace, Gina, and Gilda facilities occurs. Because the construction takes place during just a fraction of one year and affects only one beach of seven in the Geopiece, this impact level appears reasonable.

The other model results are primarily driven by the attendance changes. In our case study, the economic effects model predicts overall economic impacts of about 0.2 percent of total recreational spending for the construction scenario in the Eastern Santa Barbara Channel. The predicted overall economic effects for operation in that scenario are 0.9 and 1.4 percent in two coastal geopieces, and about 0.9 percent of total recreational spending in Ventura County as a whole. Given the changes in attendance, these estimates of change in total recreation spending seem reasonable.

Consumer surplus estimates are also driven by changes in attendance. Perhaps the best benchmark for judging the appropriateness of the consumer surplus estimates is to examine the model's estimates of consumer surplus per person. In the two OCS development and operation case studies, the per person consumer surplus estimates range from \$4.50 to \$8.20, which is consistent with the range of estimates produced in other studies of recreational values. (See, for example, Sutherland, 1983, Rowe, 1985, and Vaughan, 1982.)

In summary, the model appears to work well for its intended purpose, producing reasonable results with minimal demands on its user. In this study we were not able to determine unambiguously a relationship between the presence of an OCS platform and beach attendance. However, that issue could be pursued, perhaps using a different method. A survey of coastal recreationists, for example, could directly address how recreationists respond to the presence of offshore platforms as well as provide information on other recreation issues.

C. Hypothetical Oil Spill Case Studies

1. Introduction

The hypothetical oil spill scenarios discussed in this section require different types of model inputs than do the construction and operation case studies. Generally in the case of an oil spill the effect on recreation is dramatic but also temporary, in contrast to the subtle but ongoing possible view shed impacts associated with OCS operations. An oil spill scenario can be directly specified as the percent of boating, fishing and beach use opportunities that are precluded by a spill. The specific variables include:

- specific beaches closed
- percent of boating facilities affected
- percent of fishing structures affected
- percent of shoreline affected
- duration of the spill effects

These oil spill scenarios consider a 10,000 barrel spill, affecting approximately 10 miles of the coast. Cleanup is assumed to require 6 weeks, including a 2 week period of closing the entire beach, 2 weeks during which half the beach is closed and 2 weeks during which one-quarter is closed. The base case assumes that the spill would occur during the summer peak recreation season.

Different assumptions for the timing and duration of the cleanup period and percent of use during cleanup are possible and the model is able to recognize such differences in estimating impacts. To demonstrate the flexibility of the model and determine its sensitivity to variations in assumptions, in Humboldt County we also evaluated one scenario assuming an 8 week cleanup period during peak season (with beaches completely closed for four weeks) and one assuming a 6-week cleanup during midwinter, in addition to the summer 6-week scenario.

2. Orange County Scenario

For the Orange County oil spill scenario, we assumed a 12 mile oil spill from the Santa Ana River through Laguna Beach. Such a spill would affect the following beaches:

- Santa Ana River
- Newport
- Balboa
- Corona del Mar
- Little Corona
- Crystal Cove
- Crescent Bay
- Fisherman Cove
- Main (Laguna)

Also included are numerous "pocket" beaches whose attendance is consolidated with the larger beaches.

This reach of coastline contains 77 percent of the Newport Beach geopiece's boat storage facilities, but none of the Laguna Beach geopiece's boating facilities.

Fishing piers and jetties affected in the Newport Beach geopiece include:
Newport Pier
Balboa Pier
Newport Harbor West Jetty
Corona del Mar State Beach Jetty

Oil spill effects on fishing access from the shoreline were evaluated by estimating from maps the percent of shoreline affected by the spill. In the Newport Beach geopiece 38 percent of the coast would be affected. In the Laguna Beach geopiece the portion is 26 percent.

Model Results. This scenario affects 9 beaches and 2 geopieces in Orange County, reducing attendance and associated spending for all four activity categories.

For the summer 6-week case, attendance decreases in boating of 10.2 percent, on an annual basis, are projected in the Newport Beach geopiece. Fishing in that geopiece was estimated to decrease by 7.1 percent. Although some of the fishing area in the Laguna Beach geopiece is removed, the spillover effects from Newport Beach should nullify any decrease in attendance there for fishing, actually resulting in a 0.5 percent gain in fishing attendance. Both geopieces would experience a decrease in beach attendance, about 6.8 percent in Newport Beach and about 6.1 percent in Laguna Beach, on an annual basis (See Table 1-4).

Changes in spending would amount to about 7.2 percent in the Newport Beach geopiece and 2.6 percent in the Laguna Beach geopiece, on an annual basis. Overall, Orange County would experience a spending decrease by coastal tourists of 6.5 percent, and an overall decrease of about 1,530 jobs and $28 million in income.

Consumer surplus losses for all activities in both geopieces totals $18,300,000, or a 7.0 percent decline from an annual total of $263 million.

3. Humboldt County Scenario

This case study assumes that a 10,000 barrel oil spill would contaminate the 12 mile stretch of coast from North Spit, near Arcata, to Table Bluff, south of Eureka. Such a spill would be expected to affect the following beaches:

Samoa Peninsula Access
Samoa Boat Ramp County Park
South Spit
Table Bluff

In addition, all of the boating facilities in Humboldt Bay, including 638 identified moorings, berths and dry storage areas, could be either directly affected or activities from those areas blocked by a spill.

Recreational fishing opportunities would also be drastically curtailed under this scenario. All of the boat fishing, all of the fishing from structures, and fishing from 35 percent of the geopiece's shoreline could be temporarily halted by a spill.

The summer 6-week cleanup timing is assumed to be the same as in Orange County. That scenario assumes that cleanup requires 6 weeks and occurs during peak season, affecting 14 percent of annual recreation. The eight week, peak season scenario would affect 24 percent of annual recreation. The six week, wintertime scenario would affect 3 percent of annual recreation.

Model Results. This scenario affects 5 beaches and 1 geopiece in Humboldt County. All four activity categories are impacted to some extent, with boating impacts being the most significant.

The Humboldt Bay geopiece is among the most attractive sections of the California coastline. Of the 49 coastal geopieces it ranks eighth for beach activities and second in an index reflecting recreation use not accounted for by

TABLE 1-4
EFFECTS FROM ORANGE COUNTY SCENARIO
OIL SPILL IMPACTS

EFFECT	BASELINE	CHANGE	PERCENT CHANGE
Beach Attendance in Geopiece 448	31,478,000	(2,139,000)	-6.8%
Beach Attendance in Geopiece 449	3,715,000	(227,000)	-6.1%
Boating Attendance in Geopiece 448	1,076,000	(110,000)	-10.2%
Boating Attendance in Geopiece 449	602,000	16,000	2.7%
Fishing Attendance in Geopiece 448	950,000	(67,000)	-7.1%
Fishing Attendance in Geopiece 449	765,000	4,000	0.5%
Visitor Spending in Geopiece 448	$464,623,000	$33,630,000	-7.2%
Visitor Spending in Geopiece 449	$91,585,000	$2,332,000	-2.5%
Visitor Spending in Orange County	$556,208,000	($35,962,000)	-6.5%
Tourist-related Jobs in Orange County	23,700	(1,530)	-6.5%
Tourist-related Income in Orange County	$446,000,000	($28,900,000)	-6.5%
Consumer Surplus in Geopiece 448	$235,000,000	($16,800,000)	-7.1%
Consumer Surplus in Geopiece 449	$27,700,000	($1,500,000)	-5.4%

the nearby population. With five beaches virtually closed, however, this index for beach activities would be reduced to 20th in rank. On an annual basis the decline results in as much as a 6.9 percent decrease in attendance in the summer 6-week cleanup case, a 1.4 percent decrease in the winter case, and an 11.7 percent decrease in the summer 8-week case. These beach attendance losses represent declines of 28,000, 5,600 and 47,800 visitor-days, respectively, from a baseline total of 408,000.

With the entire geopiece closed for boating, attendance diminishes by 14 percent, 3 percent, and 24 percent for the summer 6-week, winter, and summer 8-week cases, respectively. These boating numbers represent losses of 3,900, 800 and 6,700, respectively, from a baseline total of 27,700. The summer 6-week case reduction in attendance could amount to 11 percent. That reduction would be 2 percent in the winter case, and 19 percent in the summer 8-week case. These percentage losses translate to recreation day losses of 2,900, 600 and 5,000, respectively, from a baseline sportsfishing total of 26,200 visitor-days.

Demand for retail goods and services by coastal recreationists are projected to decrease by $757,000 from a baseline of $9,506,000 or 8.0 percent in the Humboldt Bay area, under summer 6-week case conditions. The decrease would be only 1.6 percent in the winter case, and 13.6 percent in the summer 8-week case. Overall, spending of this nature in Humboldt County would decrease by 1.5 percent in the summer 6-week case, with a drop of comparable percentage in total employment and income amounting to no more than 19 jobs lost and about $354,000 less income.

Because the oil spill scenarios assume that the geopiece is temporarily closed to recreational boating during the cleanup period, consumer surplus for boating would drop to zero during this period. This short-term effect translates into an annual decrease of 14.1 percent in the summer 6-week case, 2.8 percent in the winter case, and 24.1 percent in the summer 8-week case. The percentage decreases for fishing in those three cases would be 11.4, 2.2, and 19.5 percent, respectively. Consumer surplus per person would diminish 6.7 percent for beach activities in the summer 6-week case, 1.3 percent in the winter case, and 11.5 percent in the summer 8-week case. Consumer surplus losses for all activities in both geopieces total $160,000 in the summer 6-week scenario, and $31,000 and $274,000 in the winter and eight-week scenarios, respectively, compared to a baseline consumer surplus of $2,099,000.

3. Evaluation of Model Performance

The model's performance in the case of the two Oil Spill scenarios is similar to that in the two OCS Development and Operation scenarios. The only differences are in the Project File specification and in how one assesses the reasonableness of results.

In the case of an oil spill, the model expects four variable inputs: specification of which beaches would be closed, percent of boating remaining unaffected in each geopiece, percent of fishing remaining unaffected in each geopiece, and the effective duration of the spill. The last three of these require some calculations by the user before he begins using the model. Once the Project File information is assembled by the user, the model runs as simply as in the OCS Development and Operation case described before.

The effect of an oil spill on recreation is less ambiguous than that from normal construction and operations. The model's results, therefore, are more a function of the assumptions defining the spill than of the model's workings. Given this dependence, the reasonableness of results is mostly a question of the reasonableness of the scenario specification. Assuming that an oil spill similar to those hypothesized were to occur, the effects predicted by the model appear reasonable.

In summary, the model seems to work well for the oil spill scenarios, providing reasonable and detailed results without requiring much intervention by the user.

V. MITIGATING MEASURES

In the course of evaluating the relationship between OCS activities and coastal recreation, several measures were identified that would mitigate the potential effects of OCS development on recreation.

First, scheduling construction during the winter months would sharply reduce impacts. Shortening construction schedules would also help. For example, disruption of beaches for one month can affect as little as 3 percent of annual attendance in January and as much as 16 percent in July.

A second timing issue pertains to oil spills. Obviously, no one can choose the time for an oil spill. The duration of the cleanup period, however, is partially controllable. The sensitivity analysis in the Humboldt County hypothetical oil spill case studies showed that stretching the period in which the beach is completely closed from 2 weeks to 4 weeks (and the total cleanup period from 6 weeks to 8 weeks) could increase total losses from 14 percent to 24 percent of annual attendance.

Recreation in some coastal areas is more sensitive to adverse impacts from OCS activities than it is in other areas. For example, beach recreation in the Santa Monica Bay geopiece is valued more highly than in other coastal areas. (See the chapter on Study Assumptions and Limitations for a discussion of the scope of this conclusion).

The analysis in this study to identify what factors influence beach attendance provides some guidance for mitigating adverse impacts. The estimated beach attendance equation shows, for example, that length of beachfront and adjacent parking are two factors affecting beach attendance. In order to counterbalance adverse effects from OCS development, therefore, it would be possible to enhance a beach's attractiveness by adding oceanfront or by providing adjacent parking facilities. These enhancements would not necessarily negate possible visual or noise impacts due to OCS development, but our findings suggest that they would make a beach more appealing in other ways so that any overall effect on attendance would be reduced.

Another type of mitigating measure would be to erect barriers around the construction site, primarily to attenuate noise effects. Our research in developing the Eastern Santa Barbara Channel case study showed that a 1,600 foot buffer zone was needed to avoid noise louder than California standards. The size of this buffer zone (hence the beach frontage withdrawn from use) could be reduced substantially with a barrier. The adverse effects from permanent onshore facilities can be mitigated by reducing their visual and noise intrusiveness. Pipelines can be buried and landscaped walls erected around above-ground facilities. It might also be possible for facilities to be sited far enough away from the beach that their intrusion on recreation can be eliminated entirely.

VI. CONCLUSIONS

A major focus of this study was to try to identify the factors that affect beach attendance. A cross-sectional regression analysis of 111 beaches in California established six variables that explain beach attendance: beach frontage length, urban versus rural beach location, pedestrian access, a beach's aesthetic rating, state versus local administration, and a composite proximity variable. The composite proximity variable included the population of origin counties, and those counties' recreation participation rates, distance to the beach in question and distance to substitute beaches. The variables were statistically significant at the 90 percent level of confidence or greater, and together explain 68 percent of the variance in beach attendance.

As part of the effort to identify the factors affecting beach attendance, this study also explored the relationship between offshore platforms and beach attendance. The regression analysis in this study revealed some evidence, although inconclusive, of a negative association between offshore platforms and beach attendance. Regression analysis of attendance data at beaches along the entire California coast indicates that installation of an oil platform three miles offshore from a beach might reduce attendance at that beach by several percent. However, a similar regression analysis of beach attendance data limited to Southern California beaches suggests that the presence of an oil platform is associated with increased beach attendance. However, because of low estimated statistical significance of these results and their contradictory nature, we are not confident that the presence of offshore platforms actually does affect beach attendance. This relationship, therefore, is not incorporated in the beach attendance equation used in the model produced by this study. This subject is developed in more detail in Volume 2, Section III.B and Volume 3, Section III.B.

Consumer surplus represents the value to people from (in this context) engaging in coastal recreation, less the cost incurred in doing so. This study estimated consumer surplus by inferring recreationist's willingness to pay for recreation from their travel patterns. Table 1-5 shows the annual consumer surplus accruing to people who engage in four categories of recreation activities along the coast of California. The total consumer surplus for all four activity categories in all coastal areas is $1.5 billion per year.

Table 1-5
Annual Economic Value of Coastal Recreation in California
(Millions)

Activity	Value	Confidence Interval (90% level of confidence)
Boating	$54	± $15
Fishing	$96	± $31
Water-dependent beach activities	$674	± $174
Water-enhanced beach activities	$715	± $145
TOTAL	$1,540	± $364

People traveling to coastal areas to recreate purchase local goods and services while there. This study estimated the relative importance of such recreation-based tourist spending in all coastal counties in California.

Table 1-6 shows the percent of total economic activity in each coastal county that is attributable to coastal tourism. Generally, the smaller counties are relatively more dependent on tourism than are the larger counties. The proportion of local economic activity attributable to coastal tourism ranges from less than 1 percent in Los Angeles County to nearly 18 percent in Marin County.

The OCS platform scenarios indicate that onshore construction impacts are limited to one beach, reducing beach attendance in a coastal geopiece by less than 1 percent during the construction period. In contrast, the operations phase was assumed to affect attendance at 11 beaches in 2 geopieces, reducing beach attendance in those geopieces by 1 to 3 percent. Spending and consumer surplus effects follow a similar pattern.

Both hypothetical oil spill case studies show the effects from assuming that all coastal recreation activities would be curtailed, and some completely precluded, during the effective period of the spill. The magnitude of the effects varies greatly according to the season during which the spill occurs and the duration of the cleanup period.

Adverse effects can be mitigated by a variety of methods, including scheduling construction during winter months, erecting barriers to reduce noise and visual intrusion of onshore facilities, and expediting cleanups of any oil spills. In addition, beaches that have suffered adverse impacts can be made more attractive to recreationists by extending the oceanfront and by adding adjacent parking.

Table 1-6

ESTIMATED IMPORTANCE OF COASTAL TOURISM TO LOCAL ECONOMIES
1982

County	Direct Visitor Expenditures (1)	Total Employment Generated (2)	Total Income Generated (3)	% of Total Employment (4)	% of Service Sector Employment (5)
Del Norte	2.96	97	1.82	1.89	7.73
Humboldt	33.85	1,191	22.36	3.08	8.16
Mendocino	147.00	5,068	96.04	21.65	67.58
Sonoma	215.73	8,506	163.33	8.31	25.25
Marin	393.50	14,883	281.39	18.93	45.30
San Francisco	424.03	15,499	295.98	2.62	6.04
San Mateo	209.71	8,352	158.27	3.23	8.74
Santa Cruz	275.22	10,435	198.78	16.09	49.56
Monterey	290.49	11,414	218.43	8.27	32.01
San Luis Obispo	251.37	9,508	182.05	18.49	53.87
Santa Barbara	183.15	7,154	136.53	5.07	12.93
Ventura	151.03	5,725	108.47	3.06	11.19
Los Angeles	582.84	27,126	522.66	0.73	1.64
Orange	537.19	22,894	430.65	2.54	6.52
San Diego	652.92	26,021	496.42	3.10	9.85
California (6)	4,350.98	173,873	3,313.18	1.61	4.47

Source: Applied Economic Systems, September 1986.

Notes:
(1) Millions of 1982 dollars, visitors from outside the county
(2) Total direct, indirect, and induced wage and salary employment.
(3) Total direct, indirect, and induced income in millions of 1982 dollars.
(4) Compared to total wage and salary employment for 1982.
(5) Compared to wage and salary employment in the services sector in 1982.
(6) Totals for 15 coastal counties; percentages based on overall state employment figures.

BIBLIOGRAPHY

Arnold, Robert K., Stephen Levy, and Theresa Wilkenson Carey. *Recreation Activity in California and Ten Regions of the State — 1980, Volume I*, prepared for Planning Division, California State Department of Parks and Recreation, Center for Continuing Study of the California Economy, June, 1982.

This study, in two volumes, summarizes recreation survey results and projects recreational activity in California to the year 2000. Four seasonal household surveys were conducted between summer, 1978 and spring, 1980, each covering about 1000 California residents. Respondents were surveyed about participation in various recreation activities, type of occasion (near home, day trip or overnight), time traveled, type of facility (government or non-government), effect of the cost of gasoline, and a variety of socioeconomic factors. The authors used data from the survey to project recreation patterns to the year 2000.

Arnold, Robert K., Stephen Levy, and Victoria Nourse. *Recreation Activity in California and Ten Regions of the State — 1980-2000, Volume II*, prepared for Planning Division, California State Department of Parks and Recreation, Center for Continuing Study of the California Economy, June, 1982.

California Department of Parks and Recreation. "Ocean and Beach Activities 1980-2000," Recreation Activity Profile Report No. 15, October 1983.

This report summarizes 1980 recreation activities of Californians based on in-home surveys of over 4000 individuals. Participation in various types of ocean and beach activities is given in days per capita and annual participation days. Breakdowns by season, travel time, age, income, and other variables are reported. The typical ocean and beach recreationist is male, white, 12 to 35 years of age, with an annual household income greater than $35,000, having at least some college education, and employed in a managerial or professional position. Ocean swimming is the most popular ocean and beach activity. This is a very useful report for understanding California recreation activities.

Granville Corporation. *Inventory and Evaluation of California Coastal Recreation and Aesthetic Resources*, report to the Bureau of Land Management, Pacific OCS Office, POCS Technical Paper No. 81-5, 1981.

Rowe, Robert D., Edward R. Morey, Arthur D. Ross and W. Douglass Shaw. "Valuing Marine Recreation Fishing on the Pacific Coast," prepared by Energy and Resource Consultants, Inc. for Dr. Daniel Huppert, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. La Jolla, California, March 1985.

Sutherland, Ronald. "A Regional Recreation Demand and Benefits Model," Los Alamos National Laboratory Report LA - 9699-MS (1983).

This report describes a regional recreation demand and benefits model that is used to estimate recreation demand and consumers' surplus of four activities at each of 195 sites in Washington, Oregon, Idaho and Western Montana. The major components of this research include a trip production

model, an attractions model, a gravity model and a travel-cost recreation demand curve model. The author applies the methodology to estimating existing benefits from recreation sites, and to predicting benefits from improved water quality at currently degraded sites.

Vaughan, William J. and Clifford S. Russell. "Valuing a Fishing Day: An Application of a Systematic Varying Parameter Model," Land Economics 58 (November 1982) 450-463.

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